



MARKSCHEME

November 2006

DESIGN TECHNOLOGY

Higher Level

Paper 2

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Subject Details: Design Technology HL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total 40 marks) **ONE** question in Section B [20 marks]. Maximum total = 60 marks.

General

A markscheme often has more specific points worthy of a mark than the total allows (especially for essay questions). This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each marking point has a separate line and the end is signified by means of a semicolon (;).
- An alternative answer or wording is indicated in the markscheme by a '/'; either wording can be accepted.
- Words in (...) in the markscheme are not necessary to gain the mark.
- The order of points does not have to be as written (unless stated otherwise).
- If the candidate's answer has the same 'meaning' or can be clearly interpreted as being the same as that in the mark scheme then award the mark.
- Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalising them for what they have not achieved or what they have got wrong.
- Remember that many candidates are writing in a second language; be forgiving of minor linguistic slips. Effective communication is more important than grammatical niceties.
- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalised. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with '**ECF**', error carried forward.
- Units should always be given where appropriate. Omission of units should only be penalised once. Indicate this by '**U-1**' at the first point it occurs. Ignore this, if marks for units are already specified in the markscheme.
- Do not penalise candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

SECTION A

1. (a) (i) Award **[1]** for

250 W; **[1]**

(ii) Award **[1]** mark for identifying from the data how many lamp-posts in 1 km.

i.e. 34;

and **[1]** for the calculation $34 \times 2 = 68$; **[2]**

(iii) Award **[1]** for identifying that two candelas falls on 10m^2 of roadway;
and **[1]** for calculation **[2 max]**.

$2 \times 10 = 20$ cd (must include units);
(accept candelas as unit);

[2]

(b) no of lamp heads = 68;

therefore 68 lamps uses 68×250 (17 000) watts in 1 hour or 8500 watts in $\frac{1}{2}$ hour;
so cost is $(8500/1000) \times 2 = 17$ cents;

[3 max]

(c) increased safety;

Sharper more focussed light across the junction;

[2]

(d) (i) Award **[1]** for identifying the data and **[1]** for the correct answer.

12 hours of lighting (in a 92 day period)/

each lamp head is 250 watts at 2 cents/KWh;

so lighting = $(.25 \times 12) = 3$ KWh at cost of $3 \times 2 = 6$ cents;

[2 max]

(ii) Award **[1]** for the number per km and **[1]** for hours in year and **[1]** for the answer.

68 lamp heads;

$(91 \times 7) + (91 \times 9) + (92 \times 12) + (91 \times 9) = 3377$ hrs;

$3379 \text{ hrs} \times 68 \text{ lamp heads} = 229772 \text{ hrs of lighting}$;

[3]

- (e) (i) *Award [1] for one reason and one mark for its outline.*

protect the bulb;
from environmental damage or birds;

reduce light pollution;
by directing light downwards;

[2 max]

- (ii) *Award [1] for a cost and [1] for each point in an explanation.*

maintenance costs;
as bulbs will need replacing;
and lamps become damaged;
repairs needed after accident;

labour costs involved;
because of cleaning of lamps;
surveillance of lamps;

[3 max]

2. (a) *Award [1] for a definition of alternative energy.*

energy used as an alternative to fossil fuels for example solar energy or wind energy;

[1]

- (b) *Award [1] for a difference, and [1] for each point in an explanation of a difference.*

Source of power;
tidal power is generated by the differences between high and low tide driving a turbine;
wave power is generated by the power of the waves;

location of activity;
tidal power tends to be under the surface generation;
wave power tends to be on the surface;

size of device;
tidal power requires a large structure;
while wave power uses small devices;

axis of operation;
wave power is vertical;
tidal power is horizontal;

[3 max]

3. (a) *Award [2], [1] for each point.*

composites are developed from materials that come from different groups of materials;

alloys are developed from materials that come from the same group of materials; [2]

- (b) *Award [2], [1] for reason and [1] for summary.*

less dense materials than traditional materials;
so products and structures are lighter;
increased strength;

because of combined properties of different materials
have superior or different properties;
so have spurred new product development;

[2 max]

4. (a) *Award [1] for each of two psychological factors.*

smell;
light;
sound;
temperature;
taste;
texture;

[2 max]

- (b) *Award [1] for limitation [1] for summary.*

users do not carry out tasks in the same way;
so data may be unreliable when observing users behaviour;

users have different perceptions of situations *e.g.* comfort;
so obtaining users responses may provide unreliable data;

obtaining static data is straightforward;
but users interact with products and systems dynamically making accurate data gathering difficult;

[2 max]

5. (a) *Award [1] for each point in the list.*

high protein;
high fibre;
low salt;
low cholesterol;

[2 max]

- (b) *Award [1] for reason and [1] for summary.*

increase in vegetarianism;
so mycoprotein is a meat alternative;

can be coloured and formed to look like meat;
so is suitable as a vegetarian alternative when dining with meat eaters *e.g.* B-B-Q;

used by meat eaters as a substitute for meat on occasions;
because of its nutritional value;

used by health conscious people;
as part of a low-fat diet;

[2 max]

6. (a) stiffness of a material is called the elastic modulus and in relation to tensile and compressive loads the elastic modulus is called Young's Modulus;

OR

the relationship of stress and strain;

[1 max]

- (b) *Award [1] for each of three separate points. (These could be answered in words without graph as long as meaning is explained.)*

discussion

for elastic region = material not deformed plastically;

for plastic region = material deformed plastically;

discussion of yield point;

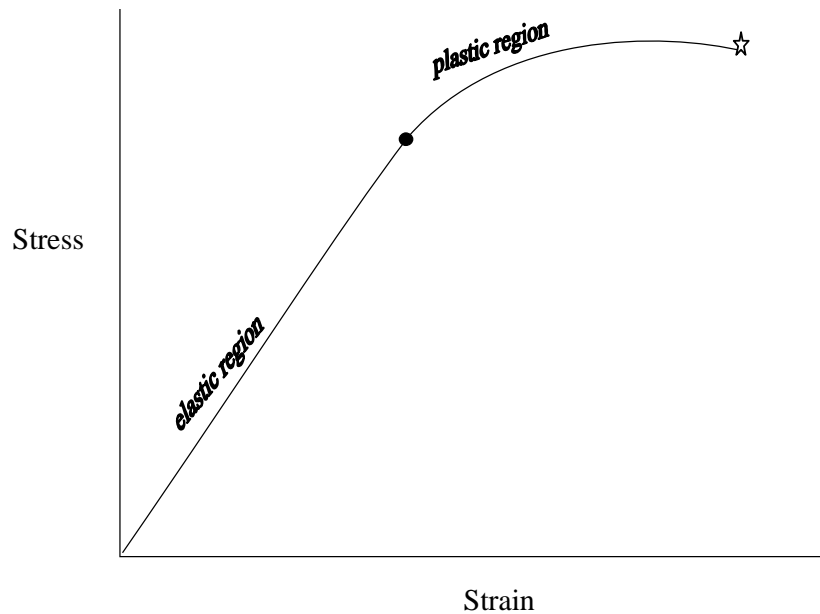
graph

elastic = straight line;

plastic = curved line;

identification of yield point;

[3]



SECTION B

7. (a) (i) *Award [1] for naming one property of a suitable material and [1] for brief description.*

toughness;
so it will not crack easily;

ductility;
allows shape to be drawn without fracture;

[2 max]

- (ii) *Award [1] for the advantage and [2] for the explanation.*

extrusion allows the material to be drawn into a continuous length/constant;
cross section and then cut to required lengths later;
no finishing required;
good for volume production;
easy to produce hollow shapes;
low cost;

[3 max]

- (b) (i) *Award [1] for identifying the property and [1] for outlining a reason for use.*

medium tensile strength;
so strong enough to resist wind damage;

low density;
so easy to transport and handle;

medium toughness;
so will be durable in use;

medium stiffness;
so will remain rigid enough,

[2 max]

- (ii) *Award [1] for each distinct point concerning an ecophobe's attitude along the lines of:*

ecophobes resent discussion about green issues;
so will be unconcerned about the environmental benefits of the product;

[2]

- (c) (i) the assessment of the effect a product has on the environment;
from the initial concept to disposal; **[2]**

- (ii) *Award [1] for each design consideration and [1] for each distinct point in a discussion [3 max];*

Size;
rate of plant diameter growth;
weight of tree;
height of tree;

Support for plant;
wind conditions;
strength/consistency of soil;
ease of fixing;

Aesthetics;
colour of surroundings;
UV biodegradability;

Production;
high volume method;
low cost;

Life cycle;
no maintenance;
does not inhibit tree growth;
planned obsolescence;

Material;
Low cost;
Biodegradable;
Compatible for production process;

[9 max]

8. (a) (i) member needs to be long to keep the cables apart;
as if too close there is the danger of them touching causing a short circuit; [2]
- (ii) balance of tensile and compressive forces;
to achieve a stable structure;
via the geometry of the design;
symmetrical design; [3]
- (b) (i) *Award [1] for reference to production method and [1] for reason.*

batch production;
although high volume different types; [2 max]
- (ii) *Award [1] for stage in cycle and [1] for reason.*

mature stage;
still being built/needed/used and will continue to do so because of cost of
underground cabling; [2]
- (c) (i) *Award [1] for each distinct point for example.*

children may climb them;
aircraft may fly into them;
birds may perch on them; [2 max]
- (ii) *Any three reasons [3 max] each reason.*

does not conduct electricity;
so appropriate to support the cables;
to ensure they do not touch the metal frame;

does not corrode;
so will resist weathering;
and need no maintenance;

easy to manufacture;
by casting or moulding;
so low cost;

clay is an available resource;
in many global locations;
so can be manufactured in different countries; [9 max]

9. (a) (i) *Award [1] for reason and [1] for description.*

Angle toward the sun;
more direct angle;

snow (in Russia);
to slide off;

[2 max]

- (ii) *Award [1] for the aspect and [2] for the explanation.*

properties of materials used;
give a good combination of strength, toughness and hardness;
so is durable;
and resists weathering;
or damage from wind, birds;
no decline in performance over time;

[3 max]

- (b) (i) *Award [1] for the reason and [1] for the explanation.*

quantity;
petrol pumps need a lot of electrical power;

consistency;
irregular supply of electricity from these solar panels, because of the
weather;

[2 max]

- (ii) *Award [1] for each distinct point – maximum two points.*

tax benefits;
tax penalties;
installation subsidies;
feed surplus back into grid for payment;
advertising;
subsidize research;

[2 max]

- (c) (i) *Award [1] for identifying a reason and [1] for outlining its relevance.*

heat;
keep customers warm;

inviting;
attract customers to the fuel station;

bright;
keep thieves away;

visible from a long way off;
promote solar powered lighting;

validate solar power use;
good promotion for solar power;

[2 max]

- (ii) *Award [1] for each issue identified and a further [2] for the discussion [3 max] per issue.*

sustainable technology;
so appealing to eco-conscious consumers;
which may lead to more people using the station;

good image;
shows company is pro-active;
and cares about environmental issues;

good for the environment;
reduces pollution;
and conserves resources;

costs;
fixed and variable;
to be compared to more traditional construction;

consistency of supply;
there may not be enough sun;
especially during the winter months;

inconsistent philosophy;
solar is renewable;
using to sell fuel which is non renewable;

[9 max]
